


CLAIMS

What is claimed is:

- 1 1. An adsorption filter material for producing protective materials,
2 comprising: 
3 first and second layers; and
4 an adsorption layer arranged between said first and second layers,
5 wherein the adsorption layer includes a first activated carbon layer having activated
6 carbon particles comprising at least one of granules and spherules of activated carbon,
7 said adsorption layer further comprising activated carbon fibers.
- 1 2. The adsorption filter material of claim 1, wherein said adsorption layer
2 further comprises a second activated carbon layer, said activated carbon fibers being
3 arranged in said second activated carbon layer.
- 1 3. The adsorption filter material of claim 1, wherein said activated carbon
2 fibers are arranged in said first activated carbon layer.
- 1 4. The adsorption filter material of claim 1, wherein said activated carbon
2 particles are produced by carbonization and subsequent activation of suitable granular
3 or spherical organic starting materials.
- 1 5. The adsorption filter material of claim 1, wherein said activated carbon
2 particles of said first activated carbon layer have a mean particle diameter of 0.05 to 1
3 mm.

1 6. The adsorption filter material of claim 1, wherein said activated carbon
2 particles have a specific surface (BET) of at least 800 m²/g, and up to 1,500 m²/g.

1 7. The adsorption filter material of claim 1, wherein said activated carbon
2 fibers are produced by carbonization and subsequent activation of suitable organic
3 starting fibers.

1 8. The adsorption filter material of claim 7, wherein said organic starting
2 fibers are selected from the group comprising cellulose fibers, fibers based on cellulose
3 derivatives, phenol resin fibers, polyvinyl alcohol fibers, pitch fibers, acrylic resin fibers,
4 polyacrylonitrile fibers, aromatic polyamide fibers, formaldehyde resin fibers,
5 divinylbenzene-crosslinked polystyrene fibers, lignin fibers, cotton fibers, and hemp
6 fibers.

1 9. The adsorption filter material of claim 1, wherein said activated carbon
2 fibers comprise an activated carbon fiber textile material.

1 10. The adsorption filter material of claim 1, wherein said activated carbon
2 fibers have a mean fiber diameter of 1-25 µm.

1 11. The adsorption filter material claim 1, wherein said activated carbon
2 fibers have a length-specific weight (titer) of 1-10 dtex.

1 12. The adsorption filter material claim 1, wherein the mean particle
2 diameter of said activated carbon particles is at least three times greater than the mean
3 fiber diameter of the activated carbon fibers.

1 13. The adsorption filter material of claim 1, wherein a total amount of
2 activated carbon in said activated carbon particles and said activated carbon fibers in
3 said adsorption filter material is 25-300 g/m².

1 14. The adsorption filter material of claim 2, wherein said first activated
2 carbon layer and said second activated carbon layer are arranged relative to each other
3 such that they border directly on each other or are arranged one directly above the
4 other.

1 15. The adsorption filter material of claim 1, wherein at least one of said
2 activated carbon particles and said activated carbon fibers are impregnated with a
3 catalyst.

1 16. The adsorption filter material of claim 15, wherein said catalyst is
2 selected from among metals and metal compounds, said metals being selected from the
3 group comprising copper, cadmium, silver, platinum, palladium, zinc, and mercury, and
4 their compounds.

1 17. The adsorption filter material of claim 15, wherein said catalyst is
2 impregnated by an amount equal to 0.01 to 15 wt.% of said at least one of said
3 activated carbon particles and said activated carbon fibers.

1 18. The adsorption filter material of claim 1, wherein at least one of said
2 first layer and said second layer is an air-permeable textile material.

1 19. The adsorption filter material of claim 1, wherein at least one of said
2 first layer and said second layer is rendered oleophobic.

1 20. The adsorption filter material of claim 1, wherein at least one of said
2 first layer and said second layer is a support layer for said adsorption layer.

1 21. The adsorption filter material of claim 2, wherein one of said first layer
2 and said second activated carbon layer comprises a support layer for said first activated
3 carbon layer, and wherein one of said second layer and said first activated carbon layer
4 comprises a support layer for said second activated carbon layer.

1 22. The adsorption filter material of claim 1, wherein said adsorption filter
2 material is formed as an air-permeable multilayer composite material that comprises
3 several layers joined together.

1 23. The adsorption filter material of claim 1, wherein said adsorption filter
2 material has a total weight of 75-1,000 g/m².

1 24. The adsorption filter material of claim 1, wherein said adsorption filter
2 material is gas-permeable and air-permeable, and the gas-permeability and air-
3 permeability of said adsorption filter material is greater than 50 L•m⁻²•s⁻¹, and as high as
4 10,000 L•m⁻²•s⁻¹.

1 25. The adsorption filter material of claim 1, wherein said adsorption filter
2 material has a water vapor permeability of at least 5 L/m² per 24 h.

1 26. The adsorption filter material of claim 1, further comprising at least
2 one barrier layer between said adsorption layer and at least one of said first and second
3 layers.

1 27. The adsorption filter material of claim 26, wherein said barrier layer is
2 designed to be permeable to water vapor and essentially impermeable to gas and air.

1 28. The adsorption filter material of claim 26, wherein said barrier layer is
2 at least essentially impermeable at least retards passage of toxic chemical agents and
3 chemical warfare agents.

1 29. The adsorption filter material of claim 26, wherein said barrier layer is
2 at least essentially impermeable or at least retards the passage of liquids and aerosols.

1 30. The adsorption filter material of claim 26, wherein said barrier layer is
2 applied as a continuous closed layer on one of said first and second layers.

1 31. The adsorption filter material of claim 26, wherein a thickness of said
2 barrier layer is 5-500 µm.

1 32. The adsorption filter material of claim 26, wherein said barrier layer
2 comprises at least one of a plastic and an organic polymer.

1 33. The adsorption filter material of claim 26, wherein said barrier layer
2 comprises one of a multilayer laminate and a multilayer composite comprising several
3 layers of plastic or polymer.

1 34. The adsorption filter material of claim 26, wherein said adsorption
2 filter material has a water vapor permeability of at least 10 L/m² per 24 h with said
3 barrier layer at a thickness of 50 µm.

1 35. The adsorption filter material of claim 2, wherein said adsorption filter
2 material is a composite material with several successive layers bonded to one another,
3 wherein said adsorption filter material contains the following layers in sequence:

4 said first layer, wherein said first layer comprises a textile that has been
5 rendered oleophobic;

6 a water vapor-permeable and at least essentially gas-impermeable and
7 air-impermeable barrier layer;

8 said adsorption layer, wherein said adsorption layer comprises said first
9 activated carbon layer with said activated carbon particles and said second activated
10 carbon layer with activated carbon fibers; and

11 said second layer, wherein said second layer comprises a textile layer.

1 36. The adsorption filter material of claim 1, wherein said adsorption filter
2 material is thermally stable.


1 37. Use of the adsorption filter material of claims 1 for producing
2 protective materials.

1 38. The use of the adsorption filter material of claim 37, wherein said
2 protective materials are selected from the group consisting of protective suits for civilian
3 or military use, protective gloves and protective covers.

1 39. Use of the adsorption filter material of claim 1 for producing filters and
2 filter materials for the removal of noxious substances, foul-smelling substances, and
3 toxic substances of all types from air and gas flows, the filters and filter materials being
4 selected from the group consisting of gas mask filters, deodorant filters, surface filters,
5 air filters, filters for room air purification, adsorptive support structures, and filters or filter
6 materials for medical applications.

1 40. A protective material including one of a protective suit, a protective
2 glove, and a protective cover, produced using said adsorption filter material of claim 1
3 and including said adsorption filter material.

1 41. A method for improving the breakthrough behavior of an adsorption
2 filter material having a first layer, a second layer, and an adsorption layer arranged
3 between the first layer and the second layer, said method comprising the step of
4 forming the adsorption layer using a combination of activated carbon fibers and granular
5 or spherical activated carbon particles, such that the activated carbon particles and the



- 6 activated carbon fibers are present in one of a single activated carbon layer or in
- 7 separate activated carbon layers which border each other.